Investigation and Demonstration of a Rich Combustor Cold Start Device for Alcohol Fueled Engines

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1/95–3/97

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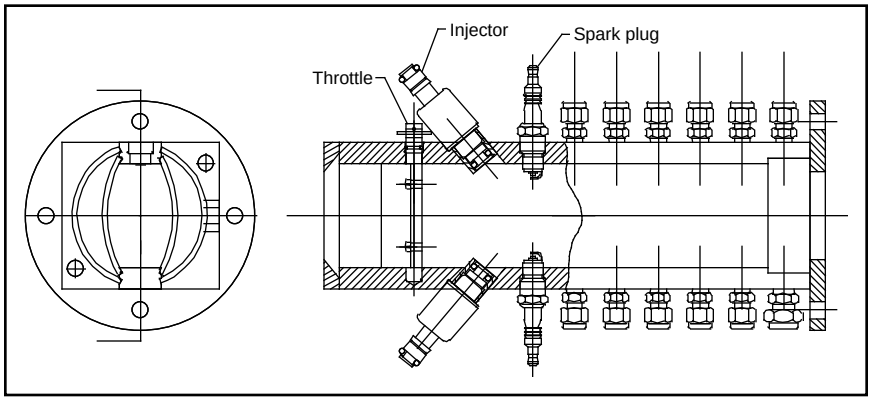
Objective

To design, fabricate, and demonstrate a rich combustor device intended to facilitate cold starting of alcohol-fueled spark ignition engines.

Approach

The University of Tennessee has previously conducted proof-of-concept tests that have shown a methanol-fueled spark ignition engine can be started with gases produced by a rich combustor device fueled with methanol. The gases generated by the rich combustor device contain the noncondensable flammable gases hydrogen and carbon monoxide that serve to start the engine at temperatures as low as -30°C.



Prototype rich combustor design

Accomplishments

A prototype rich combustor has been fabricated and installed on the test engine located inside a refrigerated room built to provide cold start conditions. The engine is coupled to an engine dynamometer which allows testing of the entire system, minimizing the task of vehicle integration.

The prototype is installed between the existing throttle body and the intake manifold on the engine, and divides the air flowing through the throttle body into two (physically three) streams. One stream flows through the combustion chamber where fuel is added and ignited. The fuel droplets burn in a rich diffusion flame to produce the desired products which will be used to fuel the engine. This stream can be throttled to reduce the flow through it as the engine warms up and the requirement for the noncondensable gases is reduced. The remaining air flow is directed around the combustion chamber unaffected except for heat transfer from the combustion chamber and rejoins the combustor products prior to entering the intake manifold.

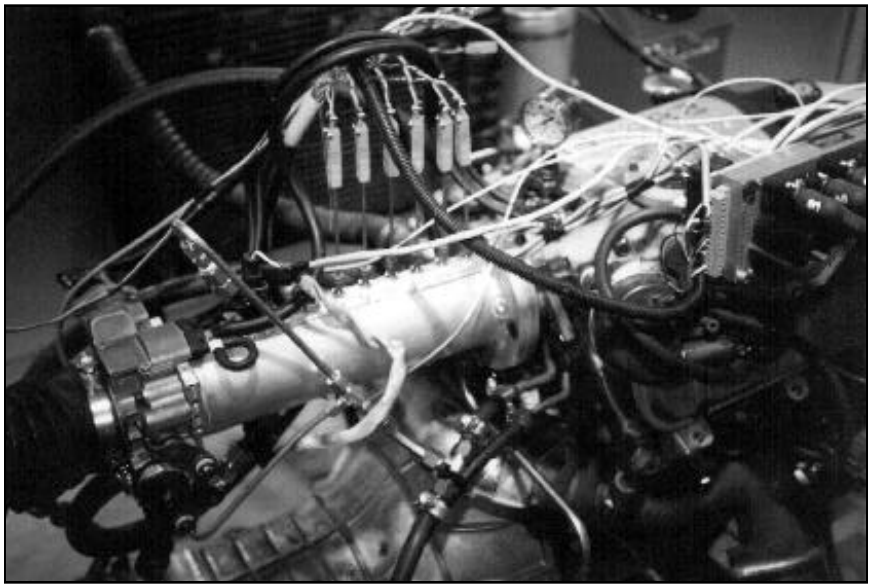
The test engine has been started at room temperature using the rich combustor.

Future Direction

Work will continue testing the rich combustor at lower temperatures. Once the operating parameters are determined for the range of temperatures considered, emission and fuel economy tests will be run. The rich combustor will then be redesigned for minimum size and installed on the test vehicle and operational tests perfomed

Publications

None to date.



Prototype rich combustor installed on test engine